

AMENDMENTS TO THE CLAIMS:

Claims 1, 2, 4-14, 16-22, 24-29, and 31-42 were pending at the time of the Office Action.

Claims 1, 2, 4-9, 12-14, 16-21, 25, 27, 36, 37, and 40 are hereby requested to be amended.

1. (Twice Amended) An apparatus for supporting a manufacturing tool relative to a workpiece, the apparatus comprising:

a track assembly adapted to be attached to the workpiece;

a carriage moveably coupled to the track assembly and moveable relative to the workpiece along a translation axis, the carriage including a tool support configured adapted to receive and support a manufacturing tool; and

an opposing-force support assembly operatively coupled to the carriage and configured adapted to be controllably secured to the workpiece to at least partially counterbalance a manufacturing force exerted on the workpiece by the manufacturing tool, wherein the track assembly includes a vacuum cup assembly configured adapted to secure to a surface of the workpiece, and wherein the opposing-force support assembly includes:

a first member moveably coupled to the carriage and moveable along a first axis;

a first actuator coupled to the first member and to the carriage and configured to move the first member along the first axis;

a second member moveably coupled to the first member and moveable along a second axis orthogonally oriented with respect to the first axis;

a second actuator coupled to the second member and to the first member and configured to move the second member along the second axis; and

a securing device coupled to the second member and configured to be secured to the workpiece.

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2. (Currently Amended) The apparatus of Claim 1, wherein the opposing-force support assembly includes a clamp-up pin configured ~~adapted~~ to engage a hole in the workpiece, and a clamp-up actuator operatively coupled to the clamp-up pin and configured ~~adapted~~ to actuate the clamp-up pin into secure engagement with the workpiece.

3. (Canceled)

4. (Currently Amended) The apparatus of Claim 1, wherein the opposing-force support assembly includes a threaded pin configured ~~adapted~~ to threadedly engage a threaded hole in the workpiece.

5. (Twice Amended) An apparatus for supporting a manufacturing tool relative to a workpiece, the apparatus comprising:

a track assembly adapted to be attached to the workpiece;

a carriage moveably coupled to the track assembly and moveable relative to the workpiece along a translation axis, the carriage including a tool support adapted to receive and support a manufacturing tool; and

an opposing-force support assembly operatively coupled to the carriage and configured ~~adapted~~ to be secured to the workpiece to at least partially counterbalance a manufacturing force exerted on the workpiece by the manufacturing tool, wherein the opposing-force support assembly includes:

a first member moveably coupled to the carriage and moveable along a first axis;

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a first actuator coupled to the first member and to the carriage and configured ~~adapted~~ to move the first member along the first axis;

a second member moveably coupled to the first member and moveable along a second axis orthogonally oriented with respect to the first axis;

a second actuator coupled to the second member and to the first member and configured ~~adapted~~ to move the second member along the second axis; and

a securing device coupled to the second member and configured ~~adapted~~ to be secured to the workpiece.

6. (Twice Amended) The apparatus of Claim 5, wherein the securing device is coupled to the second member by a third actuator, the third actuator being configured ~~adapted~~ to move the securing device along a third axis orthogonally oriented to the first and second axes.

7. (Currently Amended) The apparatus of Claim 6, wherein the second axis is approximately parallel with the translation axis of the carriage, and wherein the first axis is configured ~~adapted~~ to be approximately parallel with a longitudinal axis of the manufacturing tool.

8. (Currently Amended) The apparatus of Claim 7, wherein the first member is moveably coupled to a pair of elongated members on the carriage, the elongated members being configured ~~adapted~~ to be approximately parallel with a longitudinal axis of the manufacturing tool.

9. (Currently Amended) The apparatus of Claim 7, wherein the second member is moveably coupled to a pair of elongated members on the first member, the elongated members being configured ~~adapted~~ to be approximately parallel with the translation axis of the carriage.

10. (Original) The apparatus of Claim 1, wherein the track assembly includes at least one rail, and wherein the carriage is rollably coupled to the rail.

11. (Original) The apparatus of Claim 1, wherein the carriage includes an x-axis portion moveably coupled to the track assembly, and a y-axis portion moveably coupled to the x-axis portion and moveable with respect to the x-axis portion along a y-axis oriented transversely to the translation axis.

12. (Currently Amended) The apparatus of Claim 1, wherein the carriage includes a drive assembly having a drive motor operatively engaging the track assembly and configured ~~adapted~~ to drive the carriage along the track assembly.

13. (Twice Amended) An assembly for performing a manufacturing operation on a workpiece, the assembly comprising:

a track assembly configured ~~adapted~~ to be attached to the workpiece;

a carriage moveably coupled to the track assembly and moveable relative to the workpiece along a translation axis, the carriage including a tool support configured ~~adapted~~ to receive and support a manufacturing tool;

a manufacturing tool coupled to the tool support and configured ~~adapted~~ to be engageable with the workpiece to perform the manufacturing operation on the workpiece; and

an opposing-force support assembly operatively coupled to the carriage and configured ~~adapted~~ to be secured to the workpiece to at least partially counterbalance a manufacturing force exerted on the workpiece by the manufacturing tool, wherein the track assembly includes a vacuum cup assembly configured ~~adapted~~ to secure to a surface of the workpiece.

14. (Currently Amended) The assembly of Claim 13, wherein the opposing-force support assembly includes a clamp-up pin configured ~~adapted~~ to engage a hole in the workpiece, and a clamp-up actuator operatively coupled to the clamp-up pin and configured ~~adapted~~ to actuate the clamp-up pin into secure engagement with the workpiece.

15. (Canceled)

16. (Currently Amended) The assembly of Claim 13, wherein the opposing-force support assembly includes a threaded pin configured ~~adapted~~ to threadedly engage a threaded hole in the workpiece.

17. (Currently Amended) An assembly for performing a manufacturing operation on a workpiece, the assembly comprising:

a track assembly configured ~~adapted~~ to be attached to the workpiece;

a carriage moveably coupled to the track assembly and moveable relative to the workpiece along a translation axis, the carriage including a tool support configured ~~adapted~~ to receive and support a manufacturing tool;

a manufacturing tool coupled to the tool support and configured ~~adapted~~ to be engageable with the workpiece to perform the manufacturing operation on the workpiece; and

an opposing-force support assembly operatively coupled to the carriage and configured ~~adapted~~ to be secured to the workpiece to at least partially counterbalance a manufacturing force exerted on the workpiece by the manufacturing tool, wherein the opposing-force support assembly includes:

a first member moveably coupled to the carriage and moveable along a first axis;

a first actuator coupled to the first member and to the carriage and configured ~~adapted~~ to move the first member along the first axis;

a second member moveably coupled to the first member and moveable along a second axis orthogonally oriented with respect to the first axis;

a second actuator coupled to the second member and to the first member and configured ~~adapted~~ to move the second member along the second axis; and

a securing device coupled to the second member and configured ~~adapted~~ to be secured to the workpiece.

18. (Twice Amended) The assembly of Claim 17, wherein the securing device is coupled to the second member by a third actuator, the third actuator being configured ~~adapted~~ to move the securing device along a third axis orthogonally oriented to the first and second axes.

19. (Currently Amended) The assembly of Claim 18, wherein the second axis is approximately parallel with the translation axis of the carriage, and wherein the first axis is configured ~~adapted~~ to be approximately parallel with a longitudinal axis of the manufacturing tool.

20. (Currently Amended) The assembly of Claim 19, wherein the first member is moveably coupled to a pair of elongated members on the carriage, the elongated members being configured ~~adapted~~ to be approximately parallel with a longitudinal axis of the manufacturing tool.

21. (Currently Amended) The assembly of Claim 19, wherein the second member is moveably coupled to a pair of elongated members on the first member, the elongated members being configured ~~adapted~~ to be approximately parallel with the translation axis of the carriage.

22. (Original) The assembly of Claim 13, wherein the track assembly includes at least one rail, and wherein the carriage is rollably coupled to the rail.

23. (Canceled)

24. (Original) The assembly of Claim 13, wherein the carriage includes an x-axis portion moveably coupled to the track assembly, and a y-axis portion moveably coupled to the x-axis portion and moveable with respect to the x-axis portion along a y-axis oriented transversely to the translation axis.

25. (Currently Amended) The assembly of Claim 13, wherein the carriage includes a drive assembly having a drive motor operatively engaging the track assembly and configured ~~adapted~~ to drive the carriage along the track assembly.

26. (Original) The assembly of Claim 13, wherein the manufacturing tool includes a drill and the manufacturing operation includes a drilling operation.

27. (Twice Amended) A method of performing a manufacturing operation on a workpiece, the method comprising:

moveably supporting a manufacturing assembly proximate a surface of the workpiece, the manufacturing assembly including a manufacturing tool and an opposing-force support assembly, the manufacturing assembly being moveable along a translation direction that is at least partially along a direction perpendicular to a local normal to a surface of the workpiece, wherein moveably supporting a manufacturing assembly includes applying a vacuum pressure to a surface of the workpiece, and wherein the opposing-force support assembly includes:

a first member moveably coupled to the carriage and moveable along a first axis;

a first actuator coupled to the first member and to the carriage and configured to move the first member along the first axis;

a second member moveably coupled to the first member and moveable along a second axis orthogonally oriented with respect to the first axis;

a second actuator coupled to the second member and to the first member and configured to move the second member along the second axis; and

a securing device coupled to the second member and configured to be secured to the workpiece;

applying a manufacturing force against the workpiece using the manufacturing tool, the manufacturing force being at least partially along the local normal; and

simultaneously with applying the manufacturing force against the workpiece, applying an opposing force against the workpiece using the opposing-force support assembly, the opposing force being in a direction substantially parallel with and opposite to the manufacturing force.

28. (Original) The method of Claim 27, wherein moveably supporting a manufacturing assembly proximate a surface of the workpiece includes slideably supporting the manufacturing assembly on a rail positioned proximate the surface of the workpiece.

29. (Original) The method of Claim 27, wherein applying an opposing force against the workpiece includes inserting a clamp-up pin into a hole in the workpiece and actuating a clamp-up actuator operatively coupled to the clamp-up pin.

30. (Canceled)

31. (Original) The method of Claim 27, wherein applying an opposing force against the workpiece includes inserting a threaded member into a threaded hole in the workpiece and actuating an actuator operatively coupled to the threaded member.

32. (Original) The method of Claim 27, wherein applying an opposing force against the workpiece includes applying an opposing force that at least approximately counterbalances the manufacturing force.

33. (Original) The method of Claim 27, further comprising moving the manufacturing tool along the translation direction simultaneously with applying the opposing force against the workpiece using the opposing-force support assembly.

34. (Original) The method of Claim 27, further comprising performing the manufacturing operation on the workpiece using the manufacturing tool.

35. (Original) The method of Claim 34, wherein the manufacturing tool includes a drill and the manufacturing operation includes a drilling operation.

36. (Currently Amended) An apparatus for supporting a manufacturing tool relative to a workpiece, the apparatus comprising:

a track assembly configured adapted to be attached to the workpiece;

a carriage moveably coupled to the track assembly and moveable relative to the workpiece along a translation axis, the carriage including a tool support configured adapted to receive and support a manufacturing tool; and

an opposing-force support assembly operatively coupled to the carriage and configured adapted to be secured to the workpiece to at least partially counterbalance a manufacturing force exerted on the workpiece by the manufacturing tool, wherein at least one of the carriage and the tool support are moveable relative to the opposing-force support assembly such that a manufacturing operation may be performed at a plurality of location on the workpiece relative to the opposing-force support assembly when the opposing-force support assembly is secured at a single support location to the workpiece, and wherein the opposing-force support assembly includes:

a first member moveably coupled to the carriage and moveable along a first axis;

a first actuator coupled to the first member and to the carriage and configured to move the first member along the first axis;

a second member moveably coupled to the first member and moveable along a second axis orthogonally oriented with respect to the first axis;

a second actuator coupled to the second member and to the first member and configured to move the second member along the second axis; and

a securing device coupled to the second member and configured to be secured to the workpiece.

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37. (Currently Amended) The apparatus of Claim 36, wherein the opposing-force support assembly includes at least one of a clamp-up pin configured ~~adapted~~ to engage a hole in the workpiece, a clamp-up actuator operatively coupled to the clamp-up pin and configured ~~adapted~~ to actuate the clamp-up pin into secure engagement with the workpiece, and a threaded pin configured ~~adapted~~ to threadedly engage a threaded hole in the workpiece.

38. (Previously Presented) The apparatus of Claim 36, wherein the track assembly includes at least one rail, and wherein the carriage is rollably coupled to the rail.

39. (Previously Presented) The apparatus of Claim 36, wherein the carriage includes an x-axis portion moveably coupled to the track assembly, and a y-axis portion moveably coupled to the x-axis portion and moveable with respect to the x-axis portion along a y-axis oriented transversely to the translation axis.

40. (Currently Amended) A method of performing a manufacturing operation on a workpiece, the method comprising:

moveably supporting a manufacturing assembly proximate a surface of the workpiece, the manufacturing assembly including a manufacturing tool and an opposing-force support assembly, the manufacturing assembly being moveable along a translation direction that is at least partially along a direction perpendicular to a local normal to a surface of the workpiece, the manufacturing assembly being further configured ~~adapted~~ such that the manufacturing tool is moveable relative to the opposing-force support assembly such that a manufacturing operation may be performed at a plurality of locations on the workpiece relative to the opposing-force support assembly when the opposing-force support assembly is secured to the workpiece, and wherein the opposing-force support assembly includes:

a first member moveably coupled to the carriage and moveable along a first axis;

a first actuator coupled to the first member and to the carriage and configured to move the first member along the first axis;

a second member moveably coupled to the first member and moveable along a second axis orthogonally oriented with respect to the first axis;

a second actuator coupled to the second member and to the first member and configured to move the second member along the second axis; and

a securing device coupled to the second member and configured to be secured to the workpiece;

applying an opposing force against the workpiece using the opposing-force support assembly at a support location, the opposing force being in a direction substantially parallel with an opposite to the manufacturing force; and

simultaneously with applying the opposing force against the workpiece, successively applying a manufacturing force against the workpiece using the manufacturing tool at a plurality of positions relative to the support location, the manufacturing force being at least partially along the local normal.

41. (Previously Presented) The method of Claim 40, wherein moveably supporting a manufacturing assembly proximate a surface of the workpiece includes slideably supporting the manufacturing assembly on a rail positioned proximate the surface of the workpiece.

42. (Previously Presented) The method of Claim 40, wherein applying an opposing force against the workpiece includes applying an opposing force that at least approximately counterbalances the manufacturing force.